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Socially Responsible Investing: The Robustness of the Materiality Anomaly

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ABSTRACT

In this paper we investigate the financial performance implications of firms' commitment to sustainability efforts. We evaluate three possible explanations for the abnormal returns identified in portfolios constructed on the basis of material CSR-scores; traditional risk factors, an underlying "saint" factor, or asymmetric market information prior to materiality considerations becoming publicly available. We find that abnormal returns only occur in portfolios based on sector adjusted material score change, and these returns can be fully accounted for by common risk factors, specifically the Fama and French (2015) five-factor model. Our results suggest that the risk-adjusted performance of firms highly committed to sustainability measures is insignificantly different from firms less committed to social responsibility, regardless of materiality classifications used to evaluate CSR performance.

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Table of Contents

1 Introduction

In recent years, especially during the last two decades, increasing numbers of both firms and investors have committed to integrating environmental, social and governance (ESG) data in their capital allocation. Despite the fact that most investors' main objective is to earn positive returns, many seem willing to forego some profit if this leads to substantial external benefits regarding the concerns addressed by ESG-ratings. This puts the objective of the firm into question. If shareholders derive utility from the firm operating in a sustainable fashion, then their overall *welfare* is conditional on the firm's approach to sustainability issues, rather than solely dependent on financial gains. Hart and Zingales (2017) elaborate on this and argue that companies should maximize shareholder welfare, rather than shareholder wealth, which conflicts the famous idea presented by the late economist Milton Friedman (1970): "The social responsibility of business is to increase profits".

We identify two issues related to the question of firm objective. Firstly, it may be the case that taking all stakeholders' opposing interests into consideration fully maximizes firms' long term profitability and operating performance, or it may be the case that too much consideration of non-shareholder stakeholder interests induce over-expenditure on issues unrelated to the core business and in turn destruction of shareholder value[1]. Should the first be true, investors would have a strictly financial incentive to allocate their investment decisions towards socially responsible firms. However, should the second be true, investors would have to pay a price in order to fulfill their wish to invest in a socially responsible fashion. Secondly, it may be the case that incorporating shareholders' non-monetary welfare concerns in addition to financial wealth, induces firms to consider the external costs of the firms' operations (i.e. environmental and social impact) in a different fashion that could result in a

[1] As suggested by Ferrell et al. (2016)

significant decrease in externalities at the cost of a slight decrease in returns. Should this be the case it would imply that the firm has sufficient incentives to reduce the external costs of its operations, causing it to shift its priorities, as a results of the shareholders' non-pecuniary (ethical) concerns.

Addressing the issue of firm priorities from a shareholders' perspective requires identifying whether portfolios constructed on the basis of firms' social responsibility performance significantly outperform portfolios of stocks with low social responsibility performance. However, using raw ESG scores from alternative rating agencies, Revelli and Viviani (2014) and Dorfleitner et al. (2015) find no evidence that portfolios of highly rated stocks outperform portfolios of low rated stocks. In contrast, Khan et al. (2016) find that portfolios of stocks with high "material"[2] ESG scores significantly outperform portfolios of firms with low material scores, where materiality is determined using the Sustainability Accounting Standards Board (SASB). The SASB uses a shareholders' point of view to define materiality and develops standards to distinguish, at the industry level, material from immaterial ESG issues, helping improve the signal-to-noise ratio in the firms' reports. These findings are promising when it comes to giving potential investors incentives to include sustainability criteria in their portfolio construction. However, the article fails to fully investigate whether the performance is due to some other traditional risk factor from for instance the Fama-French models, or if there is indeed a "saint" factor behind the results which can be constructed and defined as a risk factor explaining the return anomaly. This is an important distinction as it reflects whether sustainable investments are profitable precisely because they are sustainable, or whether they share a different risk premium that has yet to be examined.

[2]SASB defines material issues as issues that are reasonably likely to impact the financial condition or operating performance of a company, and are therefore most important to investors. Consequently, immaterial issues are defined as issues that are reasonably unlikely to impact financial condition or operating performance, and are therefore less important to investors. Source: `https://www.sasb.org/standards-overview/materiality-map/`

We start by investigating the performance of socially responsible investments using methods similar to Khan et al. (2016), with a different ESG rating provider. To appropriately distinguish between material and non-material scores using the SASB framework, we only consider the environmental and social dimensions (ES), which means we address Corporate Social Responsibility (CSR) as elaborated by Gerard (2019), and disregard the governance (G) part of the scores. To evaluate performance we test whether the returns of the CSR portfolios are fully accounted for by common risk factors. We consider the five factors of Fama and French (2015), as well as the momentum factor of Carhart (1997), and the liquidity factor identified by Pastor and Stambaugh (2003), and assess whether the CSR portfolios' risk-adjusted performance is robust to the choice of factor model. We further investigate whether the performance of high material CSR score portfolios relative to low score portfolios varies before and after the public release date of the SASB materiality matrix, to assess whether the lack of public information regarding materiality prior to the release date led to mispricing.

In our results we identify no significant difference in returns between portfolios constructed on the basis of high versus low scores when we use raw CSR scores, sector adjusted CSR scores, or change in CSR scores. We do however find that the return of portfolios constructed on the basis of firms with high sector adjusted material CSR score change is significantly lower than the return of portfolios constructed on the basis of firms with inferior ratings on this score specification. We further observe that these return differences can be fully accounted for using the Fama and French (2015) five factor model, and conclude that the risk-adjusted performance of portfolios based on high CSR scores is insignificantly different from that of portfolios based on low CSR scores, regardless of score specification used.

The remainder of the thesis is structured as follows. Section 2 outlines important findings in academic literature regarding the performance of socially responsible investments. Section 3 describes our hypotheses and methodology in detail. Section 4 describes our data, sources and sample construction. Section 5 presents our findings and discussion. Section 6 concludes and summarizes our findings, and presents suggestions for further research.

2 Background and Literature

With the expanding concerns about climate change and sustainability, the interest in Socially Responsible Investments (SRI) has been increasing rapidly over the last two decades. According to the Social Investment Forum (2018)[3], the amount invested in SRI portfolios grew from $639 billion in 1995 to $2.71 trillion in 2007 (324%), and have kept increasing to roughly $12 trillion in 2018 (343% since 2007). In comparison, total assets under professional managements grew from $7 to $25.1 trillion from 1995 to 2007 (259%), and further to $46.6 trillion in 2018 (85,7% since 2007). From 2016 to 2018 alone, SRIs grew by 38%. This growth suggests that an increasing number of investors explicitly pursue two types of goals: wealth-maximization *and* social responsibility. SRI investors either derive non-financial utility through socially conscious investment decisions aligned with their social and ethical values, or they are merely green-washing their portfolios due to reputational concerns. By investing rather than donating money to charitable organizations, these investors desire to enhance financial utility in addition to the social dimension, or they may be willing to forego some financial gains in exchange for the "ethical premium" associated with SRI. Addressing these issues fueled academic interest. However, results are mixed.

[3] `http://www.socialinvest.org`

Derwall et al. (2005) find that SRI improves portfolio performance according to the eco-efficiency scores they assign to US firms to construct mutually exclusive portfolios. These eco-efficiency scores are obtained using rating data from Innovest, and are defined as the ratio of the value a company adds (e.g. by producing products) to the waste the company generates by creating that value. The higher scoring portfolios outperform the lower scoring portfolios by 6% per annum between 1997 and 2003. In contrast, Bauer et al. (2005) document that SRI funds in the United States and in the United Kingdom yield the same risk-adjusted return as traditional funds on average. In their international study, Renneboog et al. (2008) find that funds based on SRI in the US, the UK, and several European and Asia-Pacific countries underperform domestic benchmarks by between 2.2% and 6.5% per year, indicating that investors do indeed pay a premium to engage in SRI.

Aktas et al. (2011) investigate the impact on Corporate Social Responsibility (CSR) from mergers and acquisitions. They find a positive relationship between acquirer gains and the target's social and environmental risk management practices, suggesting that the stock market rewards the acquirer for SRI. Additionally, they find that the acquirers CSR score improves following the acquisition of the SRI-oriented target. Moreover, Ferrell et al. (2016) find that well-governed firms that suffer less from agency concerns (less cash abundance, positive pay-for-performance, small control wedge, strong minority protection) engage more in CSR. Furthermore, they find a positive relation between CSR and value, and that CSR attenuates the negative relation between managerial entrenchment and value.

Auer and Schuhmacher (2016) find that firstly, regardless of geographic region, industry or ESG criterion, active selection of high- or low-rated stocks does not provide superior risk-adjusted performance in comparison to passive stock market investments. Secondly, in the Asia-Pacific region and in the US, in-

vestors concentrating on ethical utility derived from their portfolio choice, can follow an ESG-based investment style and still obtain a performance similar to the broad market. Whereas in Europe investors tend to pay a price for SRI.

During the financial crisis (2008-2009), socially responsible assets and the research behind it became particularly important, as the public trust in the capital markets and institutions suddenly declined. During this period, investors were likely to be concerned for the credibility of existing financial data to guide their investment decisions. Nofsinger and Varma (2014) investigate the performance of socially responsible mutual funds (SRMFs) during periods of market crisis. They report that SRMFs outperform during periods of market crises, but at the cost of underperforming during non-crisis periods. The asymmetry of these returns would be valued by investors seeking protection against downside risk. Their results are mainly driven by ESG-funds using positive screens (invest in socially responsible firms), rather than negative screens (avoid sin stocks). Sin stock investing can be seen as the opposite of SRI and include sectors like alcohol, tobacco, gambling etc. Several studies (Fabozzi et al. (2008), Hong and Kacperczyk (2009), Statman and Glushkov (2009)) suggest that investing in sin stocks yield abnormal returns. However, Blitz and Fabozzi (2017) show that these abnormal returns are fully accounted for by exposure to traditional risk factors, and find no evidence of a premium that only apply to sin stocks.

Various studies on the topic suffer from the lack of a consistent way of measuring CSR, due a an abundance of available measures, as identified by Gerard (2019). However, the CSR scores used in many studies may not appropriately capture material CSR[4] performance. Khan et al. (2016) apply a different criteria to the SRIs investigated to overcome the measurement issue. They use SASBs standards to distinguish between material and non-material ESG

[4]We here recognize CSR as the environmental and social dimensions of ESG (e.g. ES)

scores, to improve the signal-to-noise ratio in environmentally beneficial attributes reported by firms. In doing this, they find that investing in firms with high material ESG-scores significantly outperforms the benchmark. This is an important finding, as it implies that an investor can indeed be able to allocate his or her funds in a socially responsible way, without having to suffer a loss, and even make a significant profit. The findings suggest that investors can exploit variation in the materiality of sustainability signal-to-noise ratio in the investment-performance relation, thereby reducing the dimensionality of investment signals they need to consider in their asset allocation decisions. Khan et al. interpret the outperformance as follows: Since materiality classification were not previously available, investors could not react to them as soon as ESG performance data became available. Consequently the price change is realized over a longer horizon as the materiality investments start to pay off through observable metrics (such as higher accounting returns). This suggests that the superior performance may not persist once the materiality information becomes widely available. An alternative interpretation, is that the outperformance may reflect omitted risk factors. We investigate this interpretation further in this paper to assess whether the abnormal performance found is indeed due to the material scores of the firms (a "saint factor"), or whether it can be explained by traditional risk factors, specifically the five factors of Fama and French (2015), momentum factor of Carhart (1997), and the liquidity factor of Pastor and Stambaugh (2003). Furthermore, we investigate the original interpretation of Khan et al. by assessing whether the abnormal performance vanishes once the materiality mapping becomes available.

3 Theory and Methodology

Khan et al.'s findings might be a first step towards exploiting variation in the materiality of sustainability signal-to-noise ratio in the relation between investments and performance, as well as reducing the number of dimensions of investment signals considered by institutional investors when they make their investment decisions.

Investigating further whether this is the case requires addressing the following points. Firstly, the results from Khan et al. suggest that SRIs based on materiality outperform the market. We extend this research to a dataset using a different ESG-calculation to assess the robustness of these results to various ESG definitions, and limit this study to assess the CSR-component of the scores (E and S) such that we can appropriately match the materiality constraints introduced by the SASB framework to Thomson Reuters ESG-categories. This means our results are *not* directly comparable to those of Khan et al. as we use a different data source, and we disregard the governance (G) component of these scores. Secondly, we investigate whether any abnormal performance from the first point is due to traditional risk factors found in the previous literature. Thirdly, we address whether the abnormal performance persists after materiality considerations became easily available. Lastly, should none of the previous explanations resolve the anomaly, we construct a "saint" factor to assess whether the abnormal returns can be attributed to a previously undefined risk factor.

3.1 Hypotheses

We formulate the following three main hypotheses:

1. Portfolios based on material CSR-scores do not provide abnormal returns using scores from Thomson Reuters Eikon database ($H_0 : Returns_p = 0$).

Not rejecting this hypothesis suggests that no abnormal returns are found in the portfolios and would conclude the study at this point, as there is no need to further investigate the performance when the returns are insignificantly different from zero. Rejecting this hypothesis means we identify abnormal returns, and thus proceed with the next hypothesis to assess what causes these returns.

2. The abnormal returns of portfolios based on material CSR-scores can be attributed to traditional risk factors ($H_0 : \alpha = 0$).

   Not rejecting this hypothesis suggests that abnormal returns can be accounted for using common risk factors, i.e. that the risk-adjusted performance (α) of the portfolios is insignificantly different from zero. Rejecting this hypothesis implies that the risk factors addressed are not driving the returns, i.e. the portfolios yield abnormal risk-adjusted performance when accounting for traditional factors. Consequently, we then proceed with our last hypothesis to resolve the anomaly presented when rejecting this null.

3. The abnormal performance of portfolios based on material CSR-scores persists after SASB's materiality specifications become publicly available ($H_0 : \alpha_{before} = \alpha_{after}$).

   Not rejecting this hypothesis suggests that there is an underlying, previously unidentified risk factor driving the returns (a "saint" factor), as no other explanation resolves the anomaly. Rejecting this hypothesis entails that the performance is caused by mispricing in the market due to asymmetric information prior to SASB's materiality mapping becoming available.

3.2 Constructing Materiality and Immateriality Index

We use the SASB Materiality Map to give each of the datapoints (ESG subscores) a probability of being material (or immaterial) based on the firm's industry as defined by Thomson Reuters Business Classification (TRBC)[5]. To do this, we first map the issues addressed by the Thomson Reuters (TR) subscores to the issues addressed in SASBs Materiality Map. As the TR scores tend to have broader definitions than the SASB issues, we often find it necessary to map multiple SASB issues against the same TR scores, and therefore we assign an equal weight to each of the SASB issues included per score. Moreover, the scores concerning governance (G) are not directly related to CSR-performance (ES), and do not match clearly into any of the SASB issue categories. For these reasons, we disregard these, and rescale the weights assigned to ESG-subscore j by TR:

$$\omega_{TR_{adjusted},j} = \omega_{TR,j} \frac{1}{1 - \sum \omega_{TR,G}}$$

We then define weight adjusted subscore ($wass$) j for firm i at time t as

$$wass_{j,it} = \omega_{TR_{adjusted},j} SubScore_{j,it}$$

Consequently, the total CSR score for firm i at time t is

$$Total_{it} = \sum wass_{j,it} \tag{1}$$

To construct the material CSR scores we need to link the TR subscores to SASB's materiality map to segregate between material and immaterial CSR

[5]TRBC industries are less aggregated than the SICS (Sustainable Industry Classification System) industries used by SASB, such that we can easily map TRBC industries to the materiality map. TRBC sectors (which we use for sector adjustments in section 3.3) are the same as GICS sectors, apart from "Real Estate" being defined as part of "Financials". The number of firms per sector in our sample can be found in appendix A.2

issues. We do this by defining the probability of subscore j being material for firm i's industry as

$$\theta_{j,i} = \frac{A_{j,i}}{B_j}$$

where $A_{j,i}$ is the number of SASB issues underlying TR subscore j where SASB defines the issue as likely to be material for firm i's industry, and B_j is the total number of SASB issues underlying TR subscore j[6]. We then define firm i's material score at time t as

$$Material_{it} = \sum \theta_{j,i} wass_{j,it} \tag{2}$$

Finally, using the same $\theta_{j,i}$s as above, we define firm i's immaterial CSR score at time t as

$$Immaterial_{it} = \sum (1 - \theta_{j,i}) wass_{j,it} \tag{3}$$

as $1 - \theta_{j,i}$ is defined as the probability of subscore j being immaterial for firm i's industry. We note that as a consequence of the above calculations, we have that

$$Total_{it} = Material_{it} + Immaterial_{it}$$

i.e. we have now split the total CSR score into material and immaterial indices for each firm at each point in time.

3.3 Forming and Estimating Portfolios

In our study, we consider four different ways of constructing portfolios based on the scores defined (Total, Material and Immaterial):

1. *Absolute Scores*: Raw scores previously specified

[6]The full overview of the SASB issues and the TR subscores can be found in appendix B.

2. *Score Change*: Relative change in the scores, i.e.

$$\Delta Score_{it} = \frac{Score_{it} - Score_{it-1}}{Score_{it-1}} \tag{4}$$

These score changes reflect the firm's recent investments (divestments) in CSR.

3. *Sector Adjusted Scores*: Scores adjusted for sector fixed effects. Hence the residuals (e) from the following regression:

$$Score_{it} = f_s + e_{it} \tag{5}$$

where f_s are the fixed effects (mean score) of firm i's sector at time t. These scores are then how much *higher* (*lower*) firm i's score is relative to the sector the firm belongs to.

4. *Sector Adjusted Score Change*: Score change adjusted for sector fixed effects, thus the residuals (u) the following regression:

$$\Delta Score_{it} = f_s + u_{it} \tag{6}$$

Hence these scores are unexpected changes in the firm's score relative to it's sector. In other words, it reflects how much *more* (*less*) than the sector average the firm's CSR score changed (the firm invested/divested in CSR) in the previous period.

The regressions in (5) and (6) are run cross-sectionally each year.

The materiality portfolios are created yearly by assigning firms at the top (bottom) quintile material score to the top (bottom) portfolio. The same procedure is repeated for all portfolios based on the different score specifications defined. We hold value-weighted and equal-weighted portfolios one year at a time before rebalancing in the beginning of each year. It is important to note

that to ensure that we avoid a survivorship bias[7], we only consider firms *after* they have been included in the S&P 500 Compound Index for the first time. This means we consider a cumulative pool of firms as they enter the index, and keep firms in the sample regardless of whether they are excluded from the index at a later point in time.

3.4 Evaluating Performance

To evaluate abnormal performance in the previously specified portfolios, we first run regressions using the same factors as Khan et al. (2016). That is, we use Fama and French (1993) monthly calendar-time regressions that include the market, size, book-to-market, momentum (Carhart, 1997) and liquidity (Pastor and Stambaugh, 2003) factors. In their article, Khan et al. point out that the abnormal returns found *could* be interpreted as a result of other omitted risk factors, but they interpret it as the alpha capturing return predictability unassociated with risk factors and that the stock price did not fully compound immediately due to a lack of information. Specifically, they evaluate portfolio performance using the alpha (α) from following regression:

$$Return_t = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + \beta_5 LIQ_t \quad (7)$$

The interpretation suggests that the abnormal performance will not persist once materiality classifications become available. To fully investigate this, we also run separate regressions like the one in (7), over the periods before and after SASB released their materiality standards, as well as for the full period.

To further investigate whether this interpretation is valid for our sample, we introduce a different set of risk factors, specifically the Fama and French (2015) factors profitability (RMW) and investments (CMA), and use the well known

[7] A survivorship bias occurs when only the winners are considered while the losers that have disappeared are disregarded, thus it may skew the average results upwards for the surviving index as underperformers have been overlooked

five-factor model from Fama and French to further investigate the performance. Several studies have recently documented the explanatory power of this model; Blitz and Fabozzi (2017) find that this model fully resolves the sin stock anomaly, and Fama and French (2016) find that it resolves a number of stock return anomalies. Thus, we will estimate the following regression on the portfolios to evaluate performance:

$$Return_t = \alpha + \beta_1 MKT_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_6 RMW_t + \beta_7 CMA_t \quad (8)$$

The statistical significance of this alpha (α) will indicate whether the performance anomaly can be resolved by this model. Note that if a more parsimonious factor model than (8) fully explains the performance, there is no need to extend it further as the anomaly is then resolved. Similar to the procedure conducted with (7), we also estimate this model over the whole period, as well as the periods before and after SASB released their materiality standards.

4 Data

The analysis investigates social and financial performance of public companies in the US over a period of 15 years, beginning in January 2004 and ending in December 2018. We collect constituents[8] from the S&P 500 to use as a proxy for the US market in our analysis. Furthermore, using the described methodology in the previous section, we also need data on returns, ESG-scores from each constituent, the risk-free rate, as well as the market capitalization, sector and industry membership of firms, and data for the risk factors from equations (7) and (8).

[8]We will consistently refer to *firms* included in the S&P 500 Compound Index as constituents

4.1 S&P 500 Compound Index

The constituents of the S&P 500 Compound Index[9] are obtained from Compustat through the WRDS (Wharton Research Data Services)[10] database. We rebalance our portfolios at the start of each year using the set of securities included in the S&P 500. To eliminate a potential survivorship bias we include firms which are later excluded from the index.

4.2 Stock Data

The historical monthly returns for the constituents are collected from Center for Research in Security Prices (CRSP) also available through WRDS. CRSP maintains some of the most comprehensive closed-source historical databases in stock market research, where their clients are investors and researchers that rely on accurate and unbiased data. Market capitalization for each firm is collected for each fiscal year through the Compustat database, and is defined as the sum of all issue-level market values, including trading and non-trading issues. This data is required to construct value-weighted portfolios. Firms' economic sector and industry membership is extracted from Thomson Reuters Eikon database, using the TRBC, as it is the most comprehensive, detailed and updated sector and industry classification available[11]. We use the industry data to map materiality issues, and sector data to account for sector fixed effects in the ESG scores.

4.3 ESG Data

We collect the ESG performance data from the Thomson Reuters Eikon database, which has several attractive advantages to our study. One

[9] Cleaning this data, we find that the index at the beginning of each year contains exactly 500 securities, except for January 2018, where it contains 501.

[10] `https://wrds-www.wharton.upenn.edu/`

[11] Source: `https://www.refinitiv.com/en/financial-data/indices/trbc-business-classification`

advantage is that the data is performance-based and measurable with aggregate scores, unlike Bloomberg where ESG data is based on disclosure. Another advantage is that the aggregate scores are separated across 10 score-divisions concerning different ESG characteristics, which allows us to map these scores against SASBs Materiality Map[12].

4.4 Risk Factor Data

The monthly data for the Fama and French (2015) five factor model consisting of MKT (Market), SMB (Small Minus Big), HML (High Minus Low), RMW (Robust Minus Weak), and CMA (Conservative Minus Aggressive) factors, along with the MOM (Momentum) factor of Carhart (1997), is gathered from Kenneth R. French's homepage[13], together with the approximation of the risk-free rate[14]. We obtain the LIQ (Liquidity) factor[15] from Lubos Pastor's research page[16].

5 Results and Analysis

5.1 Raw Returns

In Table 1 we display the average monthly excess return[17] from the top quintile portfolios minus the bottom quintile portfolios, along with their accompanying t-stat. In bold are the return differences which are significantly different from zero at the 10 % level.

The first thing we notice is that all portfolios based on raw scores, and sector adjusted raw scores, yield results which are insignificantly different from zero at

[12] We obtain the materiality map from `https://materiality.sasb.org/`

[13] `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`

[14] Monthly US Treasury bill rate

[15] Pastor and Stambaugh (2003)

[16] `https://faculty.chicagobooth.edu/lubos.pastor/research/`

[17] Return minus risk-free rate

Table 1: Raw Returns

Average Monthly Excess Returns of CSR portfolios (in %)

	Raw Scores				Sector Adjusted Scores			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	-0,0095	-0,0753	0,0184	0,1248	0,0154	0,1391	0,0316	0,2160
Material	-0,0796	-0,3429	-0,1224	-0,5206	-0,0858	-0,7654	-0,1488	-0,9568
Immaterial	0,2078	1,1714	0,1800	1,1101	0,1389	1,2281	0,1777	1,3788
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	-0,0821	-0,5000	0,0131	0,0710	-0,0617	-0,4370	0,0824	0,4612
Material	-0,0588	-0,1841	-0,0952	-0,2855	-0,2060	-1,3922	-0,2876	-1,3934
Immaterial	0,0972	0,4390	0,0860	0,4101	0,1662	1,1187	0,2131	1,2570
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	0,1356	0,7097	0,0291	0,1176	0,1697	0,9587	-0,0700	-0,2735
Material	-0,1213	-0,4305	-0,1767	-0,7594	0,1546	0,9854	0,1286	0,5968
Immaterial	0,4292	1,4493	0,3678	1,4922	0,0843	0,5100	0,1070	0,5705
	Score change				**Sector Adjusted Score Changes**			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	0,0330	0,3624	0,1256	0,8647	0,0065	0,0827	-0,0581	-0,4242
Material	0,1496	1,4531	0,0946	0,6491	-0,1009	-1,0054	**-0,2400**	**-1,7068**
Immaterial	-0,0246	-0,3015	0,0524	0,3532	0,0736	0,6027	0,1035	0,6099
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	0,0646	0,5822	0,0944	0,5034	0,0822	0,8572	-0,0134	-0,0787
Material	0,1466	1,1601	-0,1166	-0,7210	-0,1193	-0,9434	**-0,3596**	**-2,2151**
Immaterial	0,0311	0,3044	0,0735	0,3706	0,0519	0,3490	0,0846	0,3617
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	-0,0302	-0,1881	0,1879	0,8405	-0,1448	-1,0516	-0,1477	-0,6318
Material	0,1556	0,8691	**0,5170**	**1,7919**	-0,0643	-0,3895	-0,0007	-0,0028
Immaterial	-0,1358	-1,0086	0,0102	0,0500	0,1170	0,5427	0,1414	0,6925

The table reports the difference in monthly average return above the risk-free rate between the top and bottom quintile portfolios considering a cumulative pool of firms as they enter the S&P 500 Index, sorted on total, material and immaterial CSR score, and the t-statistics of these return differences. The table segregates between 3 periods: the full period, the period before SASB released their materiality considerations, and the period after. The table further distinguish between equal-weighted and value-weighted portfolio construction. The return differences are displayed in full percentages. Values in bold are statistically significant results at the 10 % significance level for a 2-sided test.

the 10 % level. As there is no consistent outperformance or underperformance to speak of for these portfolios, we can already here reject the presence of any underlying "saint" (or "sinner") factor, as this would be embedded in the returns of these portfolios by driving them up (down). Furthermore, this means

that for these portfolios we cannot reject our first hypothesis from section 3.1 which stated that CSR portfolios do not provide abnormal returns.

When we look at score *change*, we are moving from looking at a firm characteristic of *having* high CSR-score, to looking at firms who have recently *increased* (*decreased*) their CSR-score by investing (divesting) in CSR. We notice that for portfolios based on score change (not adjusted for sector fixed effects), we find no significant difference in returns prior to the Post-SASB period, thus these results are not all that interesting with respect to our hypotheses. We do however infer that the results suggest that in this period, i.e. after materiality considerations became available, investing in material CSR issues seems to generate some outperformance.

Looking at the sector adjusted score changes, we are constructing portfolios on the basis of changes in CSR scores *above* (*below*) the sector average. Hence we look at how much more (less) firms invest in CSR relative to what is expected from firms in their sector. We notice significantly lower returns for the value-weighted top quintile portfolio in the overall period based on sector adjusted material score changes, relative to the bottom quintile portfolios (-0.24 %). This amounts to an annual return difference of -2.88 % on average, which one could argue is a noticeable return difference for most investors, which further would imply that the result is not only statistically, but also economically significant. The results suggests that unusually high expenditure on material CSR issues is in fact detrimental to firm performance. Furthermore, we see that the underperformance is even more pronounced in the Pre-SASB period (-0.36 %), but not present in the Post-SASB period. This can be interpreted as evidence in favor of the explanation that the abnormal returns may be caused by lacking information regarding materiality concerns prior to 2014 when SASB released their standards (our third hypothesis from section 3.1). We also notice that the abnormal returns are not present in the equal-weighted portfolio,

which may suggest that the effect of CSR investments on financial performance is more pronounced in larger firms relative to smaller ones. Nevertheless, we here reject our first null hypothesis, and proceed with testing the second hypothesis for the portfolios constructed on the basis of sector adjusted score change in sections 5.2 and 5.3.

5.2 Factor Adjusted Performance - Model 1

To investigate whether the abnormal returns in the portfolios are driven by underlying risk factors, we first evaluate the performance using the same risk factors as Khan et al. (2016), hence market (Mkt-rf), size (SMB), book-to-market (HML), momentum (MOM) and liquidity (LIQ), and assess whether the alpha differences[18] between the top and bottom quintile portfolios are significantly different from zero. The output from these regressions is displayed in Table 2. Looking at Panel A for the overall period we see that for total and immaterial score changes adjusted for sector fixed effects, there is no significant difference in the portfolios' performance, as was suggested from the raw returns in Table 1. For the material portfolios, we notice that the value-weighted portfolios provide a significant negative alpha difference; -3.37% per year, while for the equal-weighted portfolios the difference is still statistically insignificant.

In Panel B, for the Pre-SASB period, we find similar results to Panel A, with no significant difference in performance for the portfolios based on total and immaterial scores, as well as the equal-weighted portfolios based on material scores. We here find even more significant alpha differences the value-weighted materiality portfolios, with an annual alpha difference of -4.80 %.

In Panel C, we look at the Post-SASB period. All other returns in this period where insignificant, and we see that this is reflected in the alpha differences as none of them are significantly different from zero.

[18]Statistical significance of these differences is evaluated using t-statistics calculated using the method described in appendix E

Table 2: Fama-French Three-Factor Model with MOM and LIQ

FF3CL adjusted performance of low and high CSR scoring portfolios constructed on the basis of CSR score changes adjusted for sector fixed effects (in %)

	EW portfolios				VW portfolios			
	Q1		Q5		Q1		Q5	
Factor	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel A: Overall period - Jan 2004 to Dec 2018 (T=180)								
Total Scores								
Alpha (Monthly)	0,1010	1,3000	0,0979	1,3476	0,1022	1,0224	-0,0337	-0,3162
Mkt-rf	1,0391	48,6877	1,0250	51,3993	0,9208	33,5350	0,9800	33,4553
SMB	0,2563	7,5187	0,3067	9,6291	-0,1160	-2,6443	-0,0368	-0,7871
HML	0,0172	0,5252	0,0026	0,0842	-0,0129	-0,3058	0,0219	0,4868
MOM	-0,2197	-11,5327	-0,1636	-9,1957	-0,0327	-1,3326	-0,0744	-2,8476
LIQ	-0,0009	-0,0763	-0,0050	-0,4302	-0,0108	-0,6797	-0,0346	-2,0409
R-squared	0,9620		0,9650		0,8950		0,9010	
Q5-Q1 (Annualized)			-0,0381	-0,0298			-1,6315	-0,9299
Material Scores								
Alpha (Monthly)	0,2177	2,2196	0,0508	0,6067	0,1767	1,7605	-0,1038	-1,0161
Mkt-rf	1,0156	37,7046	1,0393	45,1925	0,9273	33,6527	0,9757	34,7673
SMB	0,3195	7,4264	0,3018	8,2165	-0,0962	-2,1853	-0,0289	-0,6445
HML	0,0177	0,4281	0,0054	0,1514	0,0413	0,9759	-0,0055	-0,1284
MOM	-0,2273	-9,4540	-0,1431	-6,9739	-0,0572	-2,3262	0,0091	0,3652
LIQ	0,0111	0,7144	-0,0140	-1,0541	-0,0154	-0,9666	-0,0120	-0,7384
R-squared	0,9411		0,9541		0,8999		0,9029	
Q5-Q1 (Annualized)			-2,0029	-1,2941			-3,3660	-1,9585
Immaterial Scores								
Alpha (Monthly)	0,0561	0,5826	0,1055	1,2244	-0,0507	-0,4455	0,0060	0,0537
Mkt-rf	1,0056	38,0080	1,0466	44,2275	0,9707	31,0577	0,9756	31,8202
SMB	0,2087	4,9395	0,2733	7,2318	-0,1860	-3,7258	-0,0903	-1,8446
HML	-0,0563	-1,3851	0,0540	1,4841	-0,0487	-1,0137	0,1218	2,5840
MOM	-0,1348	-5,7106	-0,2118	-10,0302	0,0323	1,1578	-0,0849	-3,1047
LIQ	-0,0086	-0,5600	-0,0117	-0,8512	-0,0162	-0,8935	-0,0489	-2,7542
R-squared	0,9323		0,9546		0,8705		0,8934	
Q5-Q1 (Annualized)			0,5925	0,3820			0,6804	0,3556
Panel B: Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total Scores								
Alpha (Monthly)	0,1646	1,6394	0,2358	2,6648	0,0730	0,5620	-0,0839	-0,6576
Mkt-rf	1,0454	39,1816	1,0201	43,3726	0,9073	26,2771	0,9360	27,6097
SMB	0,2858	6,0369	0,3654	8,7568	-0,1595	-2,6038	0,0094	0,1558
HML	-0,0041	-0,0996	-0,0020	-0,0544	-0,0217	-0,4109	0,1200	2,3156
MOM	-0,2149	-10,0057	-0,1566	-8,2710	-0,0207	-0,7430	-0,0965	-3,5349
LIQ	-0,0034	-0,2353	-0,0054	-0,4228	-0,0192	-1,0237	-0,0500	-2,7162
R-squared	0,9672		0,9730		0,8988		0,9237	
Q5-Q1 (Annualized)			0,8549	0,5324			-1,8827	-0,8617
Material Scores								
Alpha (Monthly)	0,3856	3,0984	0,1259	1,2024	0,2056	1,5817	-0,1940	-1,5171
Mkt-rf	1,0234	30,9382	1,0488	37,6866	0,9516	27,5499	0,9553	28,1038
SMB	0,3629	6,1838	0,3598	7,2864	-0,1051	-1,7146	-0,0195	-0,3236
HML	-0,0171	-0,3389	0,0314	0,7374	0,0151	0,2865	0,0558	1,0743
MOM	-0,2307	-8,6628	-0,1331	-5,9384	-0,0222	-0,7974	-0,0033	-0,1211
LIQ	0,0285	1,5877	-0,0198	-1,3136	-0,0187	-0,9992	-0,0239	-1,2960
R-squared	0,9517		0,9637		0,9110		0,9176	
Q5-Q1 (Annualized)			-3,1165	-1,5967			-4,7951	-2,1915

Immaterial Scores								
Alpha (Monthly)	0,1657	1,2955	0,1836	2,0281	-0,0445	-0,3017	-0,1371	-0,9573
Mkt-rf	1,0326	30,3799	1,0464	43,4948	1,0043	25,6350	0,9756	25,6402
SMB	0,1950	3,2331	0,3017	7,0677	-0,3265	-4,6966	-0,1151	-1,7042
HML	-0,1112	-2,1402	0,0310	0,8436	-0,1080	-1,8043	0,2101	3,6131
MOM	-0,1145	-4,1855	-0,2014	-10,3967	0,0592	1,8777	-0,0983	-3,2095
LIQ	-0,0161	-0,8730	-0,0123	-0,9418	-0,0247	-1,1603	-0,0748	-3,6227
R-squared	0,9370		0,9733		0,8785		0,9105	
Q5-Q1 (Annualized)			0,2149	0,1143			-1,1111	-0,4506
Panel C: Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total Scores								
Alpha (Monthly)	-0,0446	-0,3604	-0,2058	-1,7926	0,1312	0,8947	-0,0840	-0,4937
Mkt-rf	1,0205	25,6847	1,0091	27,3629	1,0230	21,7251	1,0230	18,7147
SMB	0,1970	4,0247	0,2023	4,4540	-0,0751	-1,2948	-0,0971	-1,4414
HML	0,0474	0,7612	-0,0167	-0,2894	0,0604	0,8192	-0,0764	-0,8923
MOM	-0,2325	-5,0990	-0,1992	-4,7079	-0,0671	-1,2411	0,0378	0,6026
LIQ	0,0317	1,1471	0,0379	1,4772	0,0171	0,5215	0,0478	1,2582
R-squared	0,9480		0,9531		0,9115		0,8832	
Q5-Q1 (Annualized)			-1,9348	-0,9554			-2,5823	-0,9580
Material Scores								
Alpha (Monthly)	-0,0400	-0,2574	-0,1435	-1,1707	0,1455	0,9783	-0,0151	-0,0889
Mkt-rf	0,9694	19,4096	0,9498	24,1220	0,8876	18,5833	0,9934	18,2251
SMB	0,2591	4,2106	0,2075	4,2790	-0,1028	-1,7467	-0,0343	-0,5113
HML	0,0255	0,3256	-0,1134	-1,8392	0,0000	0,0004	-0,0674	-0,7898
MOM	-0,2357	-4,1121	-0,1975	-4,3704	-0,2256	-4,1157	0,0769	1,2299
LIQ	-0,0253	-0,7285	0,0299	1,0926	-0,0165	-0,4980	0,0315	0,8308
R-squared	0,9147		0,9412		0,8919		0,8778	
Q5-Q1 (Annualized)			-1,2418	-0,5227			-1,9266	-0,7116
Immaterial Scores								
Alpha (Monthly)	-0,1685	-1,3221	-0,0594	-0,3192	-0,0136	-0,0967	0,1497	0,9695
Mkt-rf	0,9866	24,0958	1,0539	17,6287	1,0251	22,7669	0,9336	18,8211
SMB	0,1784	3,5374	0,2152	2,9218	-0,0380	-0,6845	-0,0629	-1,0290
HML	0,0316	0,4924	0,0817	0,8720	0,0900	1,2759	0,0184	0,2363
MOM	-0,1972	-4,1970	-0,2578	-3,7576	-0,0470	-0,9097	0,0142	0,2489
LIQ	0,0476	1,6710	0,0127	0,3064	-0,0037	-0,1193	0,0416	1,2058
R-squared	0,9403		0,8970		0,9184		0,8839	
Q5-Q1 (Annualized)			1,3095	0,4837			1,9592	0,7828

The table reports alphas, factor loadings, and t-statistics from monthly calendar-time Fama-French regressions for both equal-weighted and value-weighted portfolios based on sector adjusted change in CSR-scores, and considering a cumulative pool of firms entering and exiting the S&P 500 Index. Panel A reports results from the overall period, Panel B from the period before materiality considerations became available, and Panel C from the period after materiality consideration became available. All panels distinguish between total, material and immaterial scores, and contain R-squared from the regressions as well as the annualized difference in alpha between the top and bottom quintile portfolios and the accompanying t-statistic. In the models, Mkt-rf is the market excess return, SMB and HML are the Fama and French (1993) size and book-to-market factors, MOM and LIQ are the Fama and French (2015) profitability and investments factors.

The results from using this model suggests that the abnormal returns are caused by the lacking information in the market previous to materiality considerations becoming available, as the model is unable to resolve the anomaly identified for the materiality portfolios. In other words, this model does not allow us to reject our second hypothesis from section 3.1. To investigate this further, we extend the analysis to a different factor model.

5.3 Factor Adjusted Performance - Model 2

In Table 3 we present the results from regressing the returns from the portfolios based on sector adjusted score changes against the five factors from the Fama and French (2015) model.

In Panel A we see that for the full period, there there is still no abnormal performance to be found in the portfolios based on total and immaterial scores. Furthermore, we now have that the portfolios based on material scores no longer provide any statistically significant alpha difference between the top and bottom quintile portfolios, suggesting that the abnormal returns can in fact be explained by the model. This further implies that the cause of the abnormal returns was the underlying risk factors, specifically the factors added in this model, i.e. profitability (RMW) and investments (CMA). Further evidence for this explanation is found in Panel B where no abnormal performance is found in the value-weighted materiality portfolio, where we previously discovered a return anomaly. Although the alpha differences for the materiality portfolios are still slightly negative, they are insignificantly different from zero at any conventional significance level.

We interpret these results the following way: Portfolios constructed based on sector adjusted material CSR-score changes are significantly exposed to the risk factors profitability (RMW) and investments (CMA). This is reflected not only by the alpha differences being explained, but also by the statistically significant coefficient estimates found in several of the materiality portfolios in Table 3. We see that the coefficients on these factors tend to be positive for the material bottom quintile portfolios and negative for the top quintile portfolios. Intuitively, as we think of the top quintile portfolios as investing in excess CSR-investments, the exposure to these factors makes sence, especially for the CMA factor. The bottom quintile portfolios are more exposed to this factor as firms included in these portfolios are likely to be more conservative

Table 3: Fama-French Five-Factor Model

FF5 adjusted performance of low and high CSR scoring portfolios constructed on the basis of CSR score changes adjusted for sector fixed effects (in %)

	EW portfolios				VW portfolios			
	Q1		Q5		Q1		Q5	
Factor	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel A: Overall period - Jan 2004 to Dec 2018 (T=180)								
Total Scores								
Alpha (Monthly)	0,0670	0,6614	0,0518	0,5943	0,1411	1,4295	0,0530	0,4893
Mkt-rf	1,0923	37,8407	1,0737	43,2269	0,9172	32,6024	0,9679	31,3565
SMB	0,2208	4,7229	0,2940	7,3065	-0,1322	-2,9012	-0,0584	-1,1683
HML	0,1253	2,6710	0,0824	2,0416	-0,0008	-0,0183	0,0936	1,8651
RMW	-0,0652	-0,9209	0,0279	0,4582	-0,0750	-1,0870	-0,1041	-1,3761
CMA	0,0947	1,1856	0,0788	1,1472	0,0298	0,3823	-0,0729	-0,8540
R-squared	0,9333		0,9479		0,8944		0,8946	
Q5-Q1 (Annualized)			-0,1823	-0,1137			-1,0573	-0,6013
Material Scores								
Alpha (Monthly)	0,1061	0,9070	0,0250	0,2659	0,1315	1,3699	-0,0200	-0,2012
Mkt-rf	1,1000	33,0050	1,0777	40,2858	0,9729	35,5651	0,9447	33,4039
SMB	0,3035	5,6226	0,2946	6,7991	-0,0821	-1,8529	-0,0529	-1,1546
HML	0,0975	1,7997	0,0883	2,0317	-0,0027	-0,0608	0,0061	0,1329
RMW	0,0678	0,8295	0,0377	0,5754	0,1364	2,0349	-0,1533	-2,2112
CMA	0,2069	2,2443	0,0301	0,4068	0,2842	3,7556	-0,0602	-0,7701
R-squared	0,9136		0,9404		0,9054		0,9055	
Q5-Q1 (Annualized)			-0,9734	-0,5409			-1,8174	-1,0970
Immaterial Scores								
Alpha (Monthly)	0,0731	0,7088	0,1141	1,0745	0,0276	0,2468	0,1409	1,2323
Mkt-rf	1,0249	34,8606	1,0865	35,9099	0,9427	29,5314	0,9531	29,2525
SMB	0,1782	3,7430	0,2299	4,6913	-0,2003	-3,8732	-0,1236	-2,3425
HML	0,0230	0,4817	0,1583	3,2203	-0,0694	-1,3371	0,1972	3,7250
RMW	-0,0978	-1,3572	-0,1197	-1,6144	-0,1063	-1,3589	-0,1696	-2,1239
CMA	0,0153	0,1881	0,0934	1,1158	0,0047	0,0538	-0,0597	-0,6624
R-squared	0,9198		0,9289		0,8705		0,8845	
Q5-Q1 (Annualized)			0,4914	0,2766			1,3588	0,7075
Panel B: Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total Scores								
Alpha (Monthly)	0,1829	1,3451	0,2372	2,1385	0,1385	1,0795	0,0605	0,4387
Mkt-rf	1,0852	27,7034	1,0546	33,0024	0,8992	24,3224	0,9303	23,4179
SMB	0,2388	3,6484	0,3383	6,3357	-0,1663	-2,6931	-0,0018	-0,0266
HML	0,1219	2,0826	0,1014	2,1244	-0,0285	-0,5152	0,1771	2,9848
RMW	-0,1110	-1,1379	-0,0327	-0,4109	-0,0533	-0,5785	-0,0687	-0,6944
CMA	-0,0430	-0,4146	-0,0727	-0,8584	0,0771	0,7875	-0,0095	-0,0898
R-squared	0,9379		0,9562		0,8981		0,9080	
Q5-Q1 (Annualized)			0,6518	0,3096			-0,9363	-0,4143
Material Scores								
Alpha (Monthly)	0,2062	1,3138	0,1888	1,5920	0,1540	1,2368	-0,0554	-0,4428
Mkt-rf	1,1252	24,8768	1,0620	31,0803	0,9906	27,6188	0,9171	25,4342
SMB	0,3227	4,2712	0,3405	5,9653	-0,0951	-1,5864	-0,0303	-0,5034
HML	0,0935	1,3835	0,1409	2,7609	-0,0203	-0,3788	0,0553	1,0259
RMW	0,0997	0,8849	-0,0576	-0,6768	0,1637	1,8322	-0,1593	-1,7736
CMA	0,0888	0,7412	-0,1570	-1,7343	0,2438	2,5661	-0,0095	-0,0993
R-squared	0,9206		0,9519		0,9157		0,9185	
Q5-Q1 (Annualized)			-0,2092	-0,0886			-2,5124	-1,1861

Immaterial Scores								
Alpha (Monthly)	0,3173	2,4224	0,2334	1,8616	0,1088	0,7435	0,0743	0,4726
Mkt-rf	1,0050	26,6310	1,0756	29,7718	0,9466	22,4422	0,9584	21,1595
SMB	0,1604	2,5443	0,2609	4,3220	-0,3223	-4,5744	-0,1181	-1,5603
HML	-0,0050	-0,0891	0,1625	3,0113	-0,1262	-2,0022	0,2823	4,1714
RMW	-0,2468	-2,6250	-0,1130	-1,2551	-0,1455	-1,3849	-0,0641	-0,5676
CMA	-0,2216	-2,2164	-0,0979	-1,0232	-0,0829	-0,7422	-0,0614	-0,5121
R-squared	0,9318		0,9472		0,8763		0,8887	
Q5-Q1 (Annualized)			-1,0063	-0,4625			-0,4145	-0,1608
Panel C: Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total Scores								
Alpha (Monthly)	-0,0872	-0,6076	-0,2480	-1,9453	0,1263	0,8807	-0,0661	-0,3917
Mkt-rf	1,1074	24,1296	1,0905	26,7437	1,0385	22,6444	1,0210	18,9074
SMB	0,1717	2,6911	0,2058	3,6292	-0,1316	-2,0637	-0,1383	-1,8420
HML	0,0733	0,9291	-0,0357	-0,5096	0,1457	1,8472	-0,0860	-0,9257
RMW	-0,1113	-1,0450	-0,0200	-0,2115	-0,2041	-1,9175	-0,1863	-1,4870
CMA	0,3533	2,7266	0,3795	3,2967	-0,0574	-0,4431	-0,0408	-0,2678
R-squared	0,9299		0,9421		0,9151		0,8847	
Q5-Q1 (Annualized)			-1,9295	-0,8378			-2,3085	-0,8686
Material Scores								
Alpha (Monthly)	-0,0706	-0,4317	-0,1959	-1,5577	0,0983	0,6163	0,0080	0,0472
Mkt-rf	1,0573	20,2065	1,0307	25,6245	0,9646	18,9015	0,9755	17,9186
SMB	0,2332	3,2059	0,2499	4,4688	-0,0920	-1,2963	-0,0603	-0,7965
HML	0,0213	0,2369	-0,1585	-2,2918	0,0160	0,1825	-0,0872	-0,9315
RMW	-0,0700	-0,5763	0,1215	1,3014	0,0546	0,4609	-0,1202	-0,9513
CMA	0,4659	3,1545	0,4161	3,6642	0,3661	2,5413	-0,0878	-0,5715
R-squared	0,9053		0,9380		0,8752		0,8768	
Q5-Q1 (Annualized)			-1,5030	-0,6071			-1,0834	-0,3870
Immaterial Scores								
Alpha (Monthly)	-0,2102	-1,4900	-0,0684	-0,3702	-0,0034	-0,0244	0,1898	1,3366
Mkt-rf	1,0682	23,6676	1,1640	19,6804	1,0465	23,8464	0,9564	21,0521
SMB	0,1769	2,8190	0,1120	1,3615	-0,0868	-1,4217	-0,1493	-2,3637
HML	0,0160	0,2064	0,0718	0,7055	0,0940	1,2458	-0,0489	-0,6260
RMW	-0,0451	-0,4302	-0,3755	-2,7360	-0,1689	-1,6585	-0,3474	-3,2955
CMA	0,3655	2,8686	0,5555	3,3270	0,1126	0,9090	0,1806	1,4082
R-squared	0,9267		0,8981		0,9217		0,9016	
Q5-Q1 (Annualized)			1,7015	0,6096			2,3181	0,9783

The table reports alphas, factor loadings, and t-statistics from monthly calendar-time Fama-French regressions for both equal-weighted and value-weighted portfolios based on sector adjusted change in CSR-scores, and considering a cumulative pool of firms entering and exiting the S&P 500 Index. Panel A reports results from the overall period, Panel B from the period before materiality considerations became available, and Panel C from the period after materiality consideration became available. All panels distinguish between total, material and immaterial scores, and contain R-squared from the regressions as well as the annualized difference in alpha between the top and bottom quintile portfolios and the accompanying t-statistic. In the models, Mkt-rf is the market excess return, SMB and HML are the Fama and French (1993) size and book-to-market factors, RMW and CMA are the Fama and French (2015) profitability and investments factors.

with their investments, thus investors require compensation for this which is in turn is reflected in lower stock prices, driving the returns up. As the top quintile portfolios are less exposed to this risk by investing more aggressively, their prices are higher, which in turn yields lower returns. As this factor model resolves the anomaly previously identified, we conclude that we cannot reject

our second null hypothesis from section 3.1 stating that abnormal returns can be accounted for using traditional risk factors.

5.4 Factor Adjusted Performance Across Score Specifications

Table 4: Factor Adjusted Performance of All Portfolios

FF5 Adjusted Annualized Performance of CSR portfolios (in %)

	Raw Scores				**Sector Adjusted Scores**			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	0,6813	0,4346	0,7937	0,4771	0,6336	0,4106	1,0636	0,6608
Material	1,4108	0,6269	1,1256	0,5199	-0,2501	-0,1707	-1,0783	-0,6682
Immaterial	1,2253	0,5977	1,0610	0,6419	0,9042	0,5159	1,2841	0,8849
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	1,0688	0,5027	1,8375	0,8548	0,6816	0,3311	2,9348	1,4687
Material	4,1190	1,5476	3,3578	1,2079	-1,0023	-0,5310	-2,6633	-1,2562
Immaterial	-1,2970	-0,5304	-0,4642	-0,2232	1,0876	0,4584	1,6004	0,8263
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	0,9125	0,4434	0,1076	0,0426	1,3296	0,6232	-0,7662	-0,2868
Material	-0,7251	-0,2144	-0,7928	-0,2788	2,2238	1,1099	1,4403	0,6103
Immaterial	4,2205	1,4167	3,0168	1,1196	0,2502	0,1189	0,9680	0,4416
	Score change				**Sector Adjusted Score Changes**			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	0,2525	0,1467	1,4245	0,8533	-0,1823	-0,1137	-1,0573	-0,6013
Material	1,2325	0,7155	1,3171	0,7894	-0,9734	-0,5409	-1,8174	-1,0970
Immaterial	-0,1328	-0,0781	0,4382	0,2481	0,4914	0,2766	1,3588	0,7075
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	0,6405	0,2908	0,3010	0,1426	0,6518	0,3096	-0,9363	-0,4143
Material	1,4612	0,6702	-0,7549	-0,3646	-0,2092	-0,0886	-2,5124	-1,1861
Immaterial	1,1121	0,5283	0,7816	0,3311	-1,0063	-0,4625	-0,4145	-0,1608
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	-1,3697	-0,5477	1,4098	0,5277	-1,9295	-0,8378	-2,3085	-0,8686
Material	0,4336	0,1734	3,9311	1,3881	-1,5030	-0,6071	-1,0834	-0,3870
Immaterial	-2,2815	-0,9478	-1,3009	-0,5303	1,7015	0,6096	2,3181	0,9783

The table reports the difference in annualized alphas and t-statistics from monthly calender-time Fama-French 5-factor regressions between the top and bottom quintile portfolios, sorted on total, material and immaterial CSR score. The table segregates between 3 periods: the full period, the period before SASB released their materiality considerations, and the period after. The table further distinguish between equal-weighted and value-weighted portfolio construction. The alpha differences are displayed in full percentages. Values in bold are statistically significant results at the 10 % significance level for a 2-sided test.

In section 5.3 we found that the Fama-French five-factor model explains return anomalies in portfolios based on sector adjusted CSR score changes. In Table 4 we present factor adjusted performance difference (difference in alphas) between top and bottom quintile portfolios for all four score specifications, using the same Fama-French five-factor model.

We here notice that all significant abnormal returns from Table 1 has been resolved by the model. It therefore seems like the Fama-French five-factor model is well-suited for explaining abnormal returns found in portfolios based on CSR-scores, regardless of score specification, period or portfolio weighting. This implies that the abnormal returns are in fact a risk premium required by investors as compensation for exposure to the risk factors included in the model, which in turn means that the risk-adjusted difference in performance between the top and bottom quintile portfolios is insignificantly different from zero.

5.5 Present Constituents Analysis

In this section we consider a slightly different investment universe which may be regarded as more practical on a portfolio management basis. In doing this, we limit the sample to the constituents included in the S&P 500 at the beginning of each year, rather than a cumulative constituent pool as before. That is, whenever firms in our sample exit (join) the S&P 500, they will be excluded from (included in) the sample considered for the portfolios. It is important to note that creating portfolios in this manner may cause a survivorship bias, as excluded firms may indeed perform well later on despite being excluded from the index. The monthly average raw return differences between the top and bottom quintile portfolios using this approach are presented in Table 5.

Comparing this table to Table 1, we here notice some additional significant return differences. For the portfolios based on raw scores and sector adjusted

Table 5: Raw Returns: Present Constituents Analysis

Average Monthly Excess Returns of CSR portfolios (in %)

	Raw Scores				**Sector Adjusted Scores**			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	0,0487	0,4480	0,0326	0,2321	0,0491	0,4933	0,0388	0,2693
Material	-0,0518	-0,2496	-0,0998	-0,4442	-0,0910	-0,8691	-0,1617	-1,0228
Immaterial	0,1843	1,0915	0,1769	1,0857	0,1454	1,3705	0,1871	1,4522
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	-0,0016	-0,0113	0,0104	0,0586	-0,0024	-0,0183	0,0651	0,3662
Material	0,0155	0,0544	-0,0526	-0,1656	-0,1714	-1,2443	-0,2791	-1,3215
Immaterial	0,0472	0,2174	0,0682	0,3237	0,1655	1,1864	0,2253	1,3299
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	0,1492	0,9468	0,0770	0,3335	0,1519	1,0248	-0,0137	-0,0553
Material	-0,1864	-0,7507	-0,1941	-0,8540	0,0699	0,4659	0,0731	0,3403
Immaterial	**0,4584**	**1,7665**	0,3945	1,5893	0,1050	0,6806	0,1107	0,5904
	Score change				**Sector Adjusted Score Changes**			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	0,0230	0,2572	0,1302	0,8912	-0,0464	-0,6140	-0,0832	-0,6010
Material	0,0779	0,8037	0,0825	0,5683	**-0,1873**	**-1,8785**	**-0,2367**	**-1,6944**
Immaterial	-0,0669	-0,7712	0,0269	0,1814	0,0466	0,3994	0,1341	0,7940
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	0,1142	1,0181	0,1303	0,7097	0,0582	0,6251	-0,0422	-0,2427
Material	0,1007	0,7970	-0,1242	-0,7594	-0,1977	-1,5041	**-0,3768**	**-2,2907**
Immaterial	0,0521	0,4826	0,0733	0,3676	0,0526	0,3469	0,1141	0,4874
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	-0,1594	-1,0949	0,1302	0,5382	**-0,2556**	**-2,0250**	-0,1653	-0,7215
Material	0,0324	0,2227	**0,4959**	**1,7568**	-0,1665	-1,1551	0,0436	0,1693
Immaterial	**-0,3050**	**-2,1474**	-0,0659	-0,3318	0,0346	0,1960	0,1739	0,8890

The table reports the difference in monthly average return above the risk-free rate between the top and bottom quintile portfolios sorted on total, material and immaterial CSR score, and the t-statistics of these return differences, only considering firms present in the S&P 500 at the rebalancing point each year. The table segregates between 3 periods: the full period, the period before SASB released their materiality considerations, and the period after. The table further distinguish between equal-weighted and value-weighted portfolio construction. The return differences are displayed in full percentages. Values in bold are statistically significant results at the 10 % significance level for a 2-sided test.

raw scores, there are no significant differences to find, similar to what we had in Table 1, apart from a significant difference in the Post-SASB period between the immaterial portfolios based raw scores. For portfolios based on score changes we see that the top quintile value-weighted material portfolio still significantly outperforms the bottom quintile portfolio in the Post-SASB

period, just like in Table 1. Furthermore, we also identify a significant return difference between the equal-weighted portfolios based on immaterial score change in the Post-SASB period.

The main thing to note from Table 5 is the return differences from portfolios based on sector adjusted score change. We see that for the value-weighted material portfolio based on sector adjusted score change we still notice significant underperformance during both the full period and the Pre-SASB period, just like we saw in Table 1. In addition to this, we here notice significantly negative difference in returns between the equal-weighted portfolios based on the same criteria.

Similar to the raw returns presented in Table 5, the factor adjusted performance of the portfolios considered in this section, evaluated using the models from equations 7 and 8, also coincide with what we found in sections 5.2 and 5.3. The full regression output from this analysis can be found in appendix F. This suggests that our findings are transferable to a portfolio manager whose investment universe is restricted to the stocks included in the S&P 500 index at any point in time.

6 Conclusion

In this thesis we have investigated the performance of socially responsible investments using guidance from SASB to distinguish between material and immaterial issues when constructing portfolios. Exploiting variation in materiality across sustainability issues can potentially improve the signal-to-noise ratio in testing the future performance implications related to investments in sustainability, and reduce the dimensionality of investment signals used by investors committed to CSR initiatives.

We find that firms with high raw scores on CSR issues, whether these are identified as total, material or immaterial, do not on average provide significantly

higher or lower returns than firms with inferior ratings on the same issues. Furthermore, we find that this result persists when we consider firms' raw CSR scores relative to their respective economic sectors' mean, and when we evaluate changes in scores (investments/divestments in CSR) over the previous period.

When considering changes in firms' CSR scores relative to sector-specific means, we find that firms with high ratings on material issues provide significantly lower average returns than firms with inferior ratings on the same issues, suggesting that investments in CSR above the sector average may be detrimental to firm performance. However, we also find that the Fama and French (2015) five-factor model fully explains these abnormal return differences, hence the risk-adjusted performance disparity between the high- and low-ranking CSR portfolios is statistically insignificant. We interpret the explanatory power this factor model exhibits on these portfolios the following way: Firms investing less than the sector average in CSR measures suffer from higher exposure to the investment risk factor (CMA) as they are more conservative with their investments. Thus investors require compensation for this through a risk premium, amplifying returns from these firms.

Our findings suggest that commitment to CSR issues is not enhancing nor detrimental to firm performance. This further implies that investors constructing portfolios based on firms' CSR efforts in order to pursue socially responsible investments, are not paying a premium nor gaining substantial profits. If shareholders derive utility from the firm operating sustainably, these findings suggest they are not required to suffer a financial loss to achieve this. Furthermore, as this result holds across materiality specifications, we infer that such investors are able to pursue firms committing to material CSR issues with substantial external benefits, without foregoing financial profits. This may in

turn induce firms to shift their priorities towards more effectual sustainability measures to satisfy the shareholders' requirements.

Our study leaves several questions unanswered. We suggest that further research investigates the structural relation which leads to the robust performance in sustainable firms despite their CSR investments. Why is it the case that firms investing outside of their core operations are not suffering financial losses? Some explanations could be customer loyalty, brand and reputation, access to finance and employee engagement. Another area to pursue could be whether firms' investments are sufficiently aligned with shareholder objectives, and how this impacts firms' sustainability considerations. Finally, it would be useful to extend our work to include the governance component of the ESG scores, as well as to a different ESG data source, considering that some research (Chatterji et al., 2015) have shown that ratings from different independent providers do not converge.

APPENDIX

A Sample Composition

A.1 Sample Contruction

	# of Firms
SP500 Constituents 2004-2018	832
Less Compustat Data ; Market Cap	8
Less CRSP Data; Returns	5
Less Thompsen Reuters ESG Data	19
Total	800

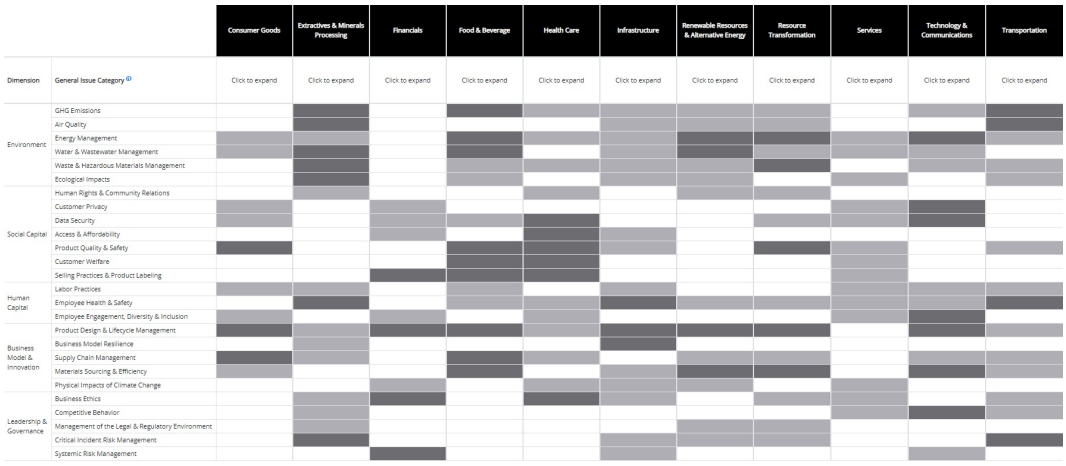
A.2 Frequency by Sector

Frequency by Sector	♯ Unique Firms
Basic Materials	46
Consumer Cyclicals	123
Consumer Non-Cyclicals	61
Energy	63
Financials	148
Healthcare	87
Industrials	100
Technology	115
Telecommunications Services	15
Utilities	42
Total	800

B ESG Categories

Thomson Reuters	SASB
Resource Use Score	Materials Sourcing & Efficiency Energy Management Water & Wastewater Management Supply Chain Management
Emissions Score	GHG Emmisions Air Quality
Environmental Innovation Score	Business Model Resilience Product Design & Lifecycle Management
Workforce Score	Labor Practices Employee Health & Safety Employee Engagement, Diversity & Inclusion
Human Rights Score	Human Rights & Community Relations
Community Score	Business Ethics Customer Welfare Access & Affordability
Product Responsibility Score	Product Quality & Safety Customer Privacy Data Security Selling Practices & Product Labeling

C Sector Level Materiality Map



Source: Sustainability Accounting Standards Board (`https://materiality.sasb.org/`)

Dark (light) colour means that for more (less) than 50 % of the industries in the sector, the issue is likely to be material. White means that the issue is not likely to be material for any industries in the sector. The full materiality map at the industry level is available at `https://materiality.sasb.org/`.

D Summary Statistics

D.1 Factor and Return Data

	Mean	Median	Std. Dev.	Q1	Q3	n
Mkt-RF	0,6313	1,0750	4,0052	-1,4775	3,1200	180
SMB	0,0903	0,0750	2,3845	-1,5750	1,7000	180
HML	-0,0263	-0,2000	2,4883	-1,3775	1,1550	180
MOM	0,1252	0,2800	4,3253	-1,5425	2,5275	180
LIQ	-1,6577	-0,9425	6,0851	-4,3088	2,0966	180
RMW	0,2729	0,2450	1,5896	-0,7825	1,1800	180
CMA	-0,0171	-0,0700	1,4100	-1,0550	0,8675	180
BAB	0,6054	0,7406	2,6062	-0,4077	2,0359	180
RF	0,1004	0,0200	0,1352	0,0000	0,1600	180
Return (Monthly)	0,0105	0,0108	0,0992	-0,0366	0,0567	88096

Note that factor data is denoted in full percentages, while return data is not.

D.2 ESG Data

ESG	Mean	Median	Std. Dev.	Q1	Q3	n
Total Score	38,3903	38,1988	11,6904	29,0588	47,7056	4484
Material Score	14,4356	12,1613	9,0373	7,4599	19,3739	4484
Immaterial score	23,9547	23,3652	10,1356	16,5862	31,1932	4484
Change in Total score	0,0437	0,0000	0,1941	-0,0376	0,0990	3294
Change in Material score	0,0588	0,0000	0,3045	-0,0484	0,0914	3294
Change in Immaterial score	0,0569	0,0000	2,7677	-0,0572	0,1215	3294

E Differences in alpha: t-statistics

To calculate the t-statistics for the difference in alpha (α) between the top and bottom portfolios, we estimate auxiliary regressions accounting for any possible correlation between the portfolios in question. Specifically, we estimate regressions in the following way:

$$Return_t = \alpha_0 + \sum \beta_j Factor_{j,t} + \alpha_1 TOP + TOP \sum \beta_k Factor_{k,t} \qquad \text{(E.1)}$$

where the summations of βs and $Factor$s are the same as in equations 7 and 8 in section 3. TOP is an indicator variable which is 0 if the specific return is for the bottom portfolio, and 1 if the return is for the top portfolio. This means that the α_0 will be the alpha for the bottom portfolio, while $\alpha_0 + \alpha_1$ is the alpha for the top portfolio, hence α_1 denotes the difference between the alphas. The t-statistic of α_1 is thus what we have used in our analysis to assess the statistical significance of the difference in return between top and bottom portfolios.

F Present Constituent Analysis

We here present factor adjusted performance from the present constituents analysis conducted in section 5.5 using the models in equations 7 and 8 from section 3.4. As can be seen from the alpha differences in the tables, the results coincide with those from sections 5.2, 5.3 and 5.4.

F.1 Fama-French Three-Factor Model including Momentum and Liquidity Factors

FF3CL adjusted performance of low and high CSR scoring portfolios constructed on the basis of CSR score changes adjusted for sector fixed effects (in %)

	EW portfolios				VW portfolios			
	Q1		Q5		Q1		Q5	
Factor	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel A: Overall period - Jan 2004 to Dec 2018 (T=180)								
Total Scores								
Alpha (Monthly)	0,1735	2,3792	0,1143	1,5158	0,1271	1,2916	-0,0314	-0,2921
Mkt-rf	1,0040	50,1360	1,0066	48,6104	0,9164	33,9107	0,9786	33,1613
SMB	0,1794	5,6104	0,2427	7,3368	-0,1241	-2,8748	-0,0525	-1,1133
HML	0,0099	0,3223	-0,0128	-0,4024	-0,0127	-0,3048	0,0266	0,5863
MOM	-0,2017	-11,2849	-0,1699	-9,1961	-0,0304	-1,2617	-0,0744	-2,8251
LIQ	0,0005	0,0395	0,0000	-0,0028	-0,0104	-0,6615	-0,0321	-1,8770
R-squared	0,9624		0,9600		0,8966		0,8990	
Q5-Q1 (Annualized)			-0,7102	-0,5642			-1,9019	-1,0877
Material Scores								
Alpha (Monthly)	0,2732	2,8237	0,0309	0,3730	0,1704	1,7072	-0,1026	-1,0107
Mkt-rf	1,0021	37,7219	1,0124	44,5406	0,9282	33,8686	0,9742	34,9426
SMB	0,2440	5,7497	0,2246	6,1861	-0,1012	-2,3126	-0,0531	-1,1923
HML	-0,0115	-0,2811	0,0039	0,1106	0,0473	1,1219	0,0129	0,3019
MOM	-0,2050	-8,6455	-0,1035	-5,1030	-0,0576	-2,3531	0,0161	0,6459
LIQ	0,0082	0,5337	-0,0147	-1,1171	-0,0171	-1,0753	-0,0127	-0,7883
R-squared	0,9375		0,9497		0,9010		0,9028	
Q5-Q1 (Annualized)			-2,9076	-1,9031			-3,2759	-1,9176
Immaterial Scores								
Alpha (Monthly)	0,1060	1,1406	0,1207	1,4864	-0,0481	-0,4297	0,0309	0,2822
Mkt-rf	0,9693	37,9710	1,0189	45,7016	0,9587	31,1867	0,9701	32,3016
SMB	0,1407	3,4514	0,1912	5,3681	-0,1974	-4,0196	-0,0963	-2,0079
HML	-0,0560	-1,4268	0,0284	0,8287	-0,0687	-1,4546	0,1180	2,5562
MOM	-0,1109	-4,8686	-0,1848	-9,2896	0,0357	1,3018	-0,0847	-3,1619
LIQ	-0,0028	-0,1872	-0,0073	-0,5666	-0,0129	-0,7243	-0,0484	-2,7795
R-squared	0,9291		0,9547		0,8703		0,8958	
Q5-Q1 (Annualized)			0,1759	0,1188			0,9477	0,5046
Panel B: Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total Scores								
Alpha (Monthly)	0,2095	2,1967	0,2379	2,6145	0,1105	0,8633	-0,0750	-0,5885
Mkt-rf	1,0056	39,6814	0,9955	41,1621	0,9028	26,5450	0,9334	27,5545
SMB	0,2316	5,1515	0,3389	7,8980	-0,1696	-2,8111	-0,0060	-0,1003
HML	-0,0137	-0,3532	0,0013	0,0339	-0,0220	-0,4240	0,1292	2,4967
MOM	-0,2079	-10,1901	-0,1692	-8,6918	-0,0201	-0,7357	-0,0969	-3,5530
LIQ	0,0011	0,0787	-0,0018	-0,1363	-0,0171	-0,9264	-0,0475	-2,5865
R-squared	0,9673		0,9703		0,9002		0,9233	
Q5-Q1 (Annualized)			0,3415	0,2159			-2,2258	-1,0270
Material Scores								
Alpha (Monthly)	0,4087	3,2252	0,0850	0,8119	0,2022	1,5584	-0,2138	-1,6478
Mkt-rf	1,0033	29,7909	1,0145	36,4662	0,9491	27,5231	0,9596	27,8275
SMB	0,3238	5,4185	0,3098	6,2764	-0,1082	-1,7681	-0,0348	-0,5680
HML	-0,0412	-0,8001	0,0265	0,6227	0,0214	0,4054	0,0692	1,3125
MOM	-0,2170	-8,0038	-0,0932	-4,1603	-0,0248	-0,8924	0,0061	0,2211
LIQ	0,0282	1,5416	-0,0180	-1,1941	-0,0205	-1,0964	-0,0245	-1,3080
R-squared	0,9464		0,9594		0,9110		0,9153	
Q5-Q1 (Annualized)			-3,8846	-1,9695			-4,9921	-2,2671

Immaterial Scores								
Alpha (Monthly)	0,1999	1,5818	0,1925	2,1718	-0,0395	-0,2680	-0,0956	-0,6856
Mkt-rf	0,9953	29,6303	1,0160	43,1352	1,0006	25,5638	0,9630	25,9790
SMB	0,1313	2,2022	0,2607	6,2389	-0,3419	-4,9228	-0,1147	-1,7440
HML	-0,1124	-2,1899	0,0194	0,5377	-0,0996	-1,6647	0,2105	3,7164
MOM	-0,0939	-3,4720	-0,1779	-9,3808	0,0642	2,0363	-0,0999	-3,3466
LIQ	-0,0054	-0,2982	-0,0085	-0,6679	-0,0234	-1,1019	-0,0717	-3,5664
R-squared	0,9314		0,9720		0,8772		0,9130	
Q5-Q1 (Annualized)			-0,0893	-0,0482			-0,6738	-0,2768
Panel C: Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total Scores								
Alpha (Monthly)	0,0820	0,7409	-0,1910	-1,7771	0,1389	0,9618	-0,0972	-0,5640
Mkt-rf	0,9801	27,5808	0,9680	28,0386	1,0183	21,9489	1,0217	18,4643
SMB	0,1027	2,3467	0,0949	2,2303	-0,0800	-1,3994	-0,1136	-1,6671
HML	0,0565	1,0145	-0,0712	-1,3167	0,0621	0,8552	-0,0800	-0,9235
MOM	-0,1681	-4,1212	-0,1821	-4,5962	-0,0582	-1,0927	0,0394	0,6208
LIQ	0,0217	0,8761	0,0536	2,2333	0,0131	0,4070	0,0525	1,3635
R-squared	0,9505		0,9530		0,9125		0,8802	
Q5-Q1 (Annualized)			-3,2757	-1,7697			-2,8327	-1,0501
Material Scores								
Alpha (Monthly)	0,0716	0,5409	-0,1217	-1,0582	0,1278	0,8619	0,0326	0,2014
Mkt-rf	0,9422	22,1610	0,9306	25,1853	0,8982	18,8589	0,9697	18,6545
SMB	0,1501	2,8667	0,1037	2,2792	-0,1112	-1,8956	-0,0662	-1,0339
HML	-0,0153	-0,2297	-0,1171	-2,0238	0,0164	0,2205	-0,0588	-0,7216
MOM	-0,1837	-3,7653	-0,1701	-4,0109	-0,2136	-3,9071	0,0684	1,1460
LIQ	-0,0391	-1,3205	0,0166	0,6449	-0,0141	-0,4262	0,0236	0,6514
R-squared	0,9264		0,9416		0,8935		0,8810	
Q5-Q1 (Annualized)			-2,3198	-1,1024			-1,1425	-0,4338
Immaterial Scores								
Alpha (Monthly)	-0,0643	-0,5476	-0,0550	-0,3366	-0,0201	-0,1390	0,1460	0,9524
Mkt-rf	0,9452	25,0576	0,9928	18,9280	0,9623	20,7352	0,9421	19,1322
SMB	0,1176	2,5299	0,0839	1,2977	-0,0421	-0,7369	-0,0747	-1,2311
HML	0,0250	0,4233	0,0118	0,1437	-0,0162	-0,2231	0,0092	0,1190
MOM	-0,1688	-3,9003	-0,2230	-3,7042	-0,0564	-1,0583	0,0165	0,2920
LIQ	0,0269	1,0254	0,0246	0,6751	0,0020	0,0630	0,0361	1,0534
R-squared	0,9415		0,9025		0,9041		0,8865	
Q5-Q1 (Annualized)			0,1121	0,0464			1,9932	0,7885

The table reports alphas, factor loadings, and t-statistics from monthly calendar-time Fama-French regressions for both equal-weighted and value-weighted portfolios based on sector adjusted change in CSR-scores, only considering firms present in the S&P 500 at the rebalancing point each year. Panel A reports results from the overall period, Panel B from the period before materiality considerations became available, and Panel C from the period after materiality consideration became available. All panels distinguish between total, material and immaterial scores, and contain R-squared from the regressions as well as the annualized difference in alpha between the top and bottom quintile portfolios and the accompanying t-statistic. In the models, Mkt-rf is the market excess return, SMB and HML are the Fama and French (1993) size and book-to-market factors, MOM is the Carhart (1997) momentum factor, and LIQ is the liquidity factor from Pastor and Stambaugh (2003).

F.2 Fama-French Five-Factor Model

FF5 adjusted performance of low and high CSR scoring portfolios constructed on the basis of CSR score changes adjusted for sector fixed effects (in %)

	EW portfolios				VW portfolios			
	Q1		Q5		Q1		Q5	
Factor	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Panel A: Overall period - Jan 2004 to Dec 2018 (T=180)								
Total Scores								
Alpha (Monthly)	0,1303	1,3793	0,0651	0,7188	0,1613	1,6605	0,0548	0,5047
Mkt-rf	1,0553	39,1978	1,0540	40,8194	0,9142	33,0191	0,9650	31,1687
SMB	0,1521	3,4877	0,2265	5,4148	-0,1382	-3,0822	-0,0758	-1,5105
HML	0,1167	2,6685	0,0811	1,9320	-0,0035	-0,0781	0,1024	2,0355
RMW	-0,0324	-0,4916	0,0100	0,1572	-0,0636	-0,9371	-0,1143	-1,5058
CMA	0,0619	0,8307	0,0412	0,5769	0,0353	0,4604	-0,0890	-1,0387
R-squared	0,9349		0,9404		0,8960		0,8934	
Q5-Q1 (Annualized)			-0,7820	-0,4979			-1,2778	-0,7306
Material Scores								
Alpha (Monthly)	0,1696	1,5118	0,0252	0,2869	0,1284	1,3386	-0,0153	-0,1548
Mkt-rf	1,0799	33,7742	1,0368	41,3549	0,9723	35,5569	0,9425	33,5092
SMB	0,2327	4,4931	0,2177	5,3606	-0,0866	-1,9552	-0,0774	-1,6987
HML	0,0607	1,1683	0,0649	1,5922	0,0085	0,1921	0,0122	0,2666
RMW	0,0780	0,9957	0,0154	0,2503	0,1372	2,0463	-0,1562	-2,2657
CMA	0,1876	2,1204	0,0201	0,2900	0,2678	3,5407	-0,0327	-0,4200
R-squared	0,9132		0,9413		0,9055		0,9052	
Q5-Q1 (Annualized)			-1,7325	-1,0127			-1,7246	-1,0441
Immaterial Scores								
Alpha (Monthly)	0,1161	1,1944	0,1341	1,3825	0,0286	0,2603	0,1633	1,4563
Mkt-rf	0,9844	35,5462	1,0497	37,9825	0,9308	29,6896	0,9480	29,6620
SMB	0,1138	2,5377	0,1483	3,3128	-0,2140	-4,2140	-0,1288	-2,4873
HML	0,0131	0,2901	0,1242	2,7648	-0,0982	-1,9277	0,1950	3,7538
RMW	-0,0903	-1,3309	-0,1333	-1,9678	-0,1178	-1,5331	-0,1653	-2,1101
CMA	-0,0029	-0,0375	0,0626	0,8195	0,0251	0,2894	-0,0653	-0,7382
R-squared	0,9201		0,9333		0,8706		0,8869	
Q5-Q1 (Annualized)			0,2161	0,1312			1,6160	0,8573
Panel B: Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total Scores								
Alpha (Monthly)	0,1927	1,4780	0,2286	1,9753	0,1623	1,2854	0,0634	0,4613
Mkt-rf	1,0547	28,0730	1,0343	31,0126	0,8987	24,7084	0,9286	23,4549
SMB	0,1897	3,0230	0,3095	5,5550	-0,1756	-2,8896	-0,0177	-0,2672
HML	0,1082	1,9286	0,1173	2,3536	-0,0311	-0,5723	0,1878	3,1755
RMW	-0,0602	-0,6431	-0,0320	-0,3853	-0,0375	-0,4137	-0,0689	-0,6983
CMA	-0,0353	-0,3543	-0,0981	-1,1104	0,0880	0,9129	-0,0153	-0,1461
R-squared	0,9368		0,9504		0,8997		0,9080	
Q5-Q1 (Annualized)			0,4309	0,2059			-1,1867	-0,5300
Material Scores								
Alpha (Monthly)	0,2221	1,4362	0,1486	1,3377	0,1572	1,2584	-0,0807	-0,6344
Mkt-rf	1,1057	24,8104	1,0185	31,8291	0,9870	27,4216	0,9222	25,1721
SMB	0,2870	3,8554	0,2962	5,5409	-0,0980	-1,6302	-0,0431	-0,7035
HML	0,0557	0,8360	0,1062	2,2225	-0,0094	-0,1757	0,0579	1,0585
RMW	0,1181	1,0637	-0,0561	-0,7041	0,1608	1,7931	-0,1445	-1,5830
CMA	0,1189	1,0072	-0,1246	-1,4698	0,2301	2,4136	0,0169	0,1742
R-squared	0,9176		0,9528		0,9149		0,9161	
Q5-Q1 (Annualized)			-0,8830	-0,3864			-2,8544	-1,3344

Immaterial Scores								
Alpha (Monthly)	0,3116	2,4653	0,2409	2,0689	0,1044	0,7109	0,1102	0,7180
Mkt-rf	0,9724	26,6992	1,0390	30,9637	0,9448	22,3365	0,9466	21,4093
SMB	0,1010	1,6592	0,2210	3,9425	-0,3361	-4,7561	-0,1198	-1,6225
HML	-0,0183	-0,3357	0,1309	2,6118	-0,1223	-1,9353	0,2809	4,2531
RMW	-0,2133	-2,3508	-0,1246	-1,4903	-0,1319	-1,2521	-0,0716	-0,6501
CMA	-0,2173	-2,2523	-0,0715	-0,8044	-0,0730	-0,6514	-0,0523	-0,4465
R-squared	0,9292		0,9500		0,8741		0,8913	
Q5-Q1 (Annualized)			-0,8482	-0,4112			0,0697	0,0274
Panel C: Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total Scores								
Alpha (Monthly)	0,0480	0,3885	-0,2299	-1,8807	0,1359	0,9653	-0,0787	-0,4630
Mkt-rf	1,0405	26,3384	1,0459	26,7527	1,0305	22,8770	1,0180	18,7266
SMB	0,0902	1,6416	0,0934	1,7190	-0,1342	-2,1428	-0,1612	-2,1331
HML	0,0833	1,2266	-0,0930	-1,3827	0,1434	1,8512	-0,0783	-0,8379
RMW	-0,0583	-0,6364	-0,0504	-0,5553	-0,1934	-1,8498	-0,2114	-1,6754
CMA	0,2319	2,0795	0,3502	3,1726	-0,0629	-0,4945	-0,0694	-0,4520
R-squared	0,9382		0,9391		0,9166		0,8831	
Q5-Q1 (Annualized)			-3,3342	-1,5991			-2,5754	-0,9724
Material Scores								
Alpha (Monthly)	0,0462	0,3291	-0,1627	-1,3432	0,0822	0,5196	0,0591	0,3664
Mkt-rf	1,0048	22,3603	0,9963	25,7191	0,9708	19,1810	0,9559	18,5229
SMB	0,1356	2,1695	0,1251	2,3222	-0,0996	-1,4158	-0,1002	-1,3965
HML	-0,0034	-0,0445	-0,1335	-2,0048	0,0330	0,3788	-0,0837	-0,9429
RMW	-0,0175	-0,1673	0,0610	0,6781	0,0554	0,4714	-0,1427	-1,1917
CMA	0,3329	2,6245	0,3197	2,9235	0,3413	2,3884	-0,0493	-0,3382
R-squared	0,9168		0,9351		0,8784		0,8814	
Q5-Q1 (Annualized)			-2,5068	-1,1263			-0,2774	-0,1023
Immaterial Scores								
Alpha (Monthly)	-0,0956	-0,7565	-0,0703	-0,4181	-0,0065	-0,0464	0,1828	1,2799
Mkt-rf	1,0134	25,0824	1,0820	20,1241	0,9955	22,3342	0,9593	20,9977
SMB	0,1084	1,9298	-0,0043	-0,0570	-0,0936	-1,5108	-0,1556	-2,4498
HML	0,0162	0,2326	0,0396	0,4288	-0,0478	-0,6237	-0,0408	-0,5193
RMW	-0,0545	-0,5815	-0,3278	-2,6272	-0,1872	-1,8094	-0,3216	-3,0332
CMA	0,3156	2,7671	0,3823	2,5186	0,2157	1,7146	0,1329	1,0308
R-squared	0,9322		0,8964		0,9106		0,9013	
Q5-Q1 (Annualized)			0,3034	0,1203			2,2711	0,9485

The table reports alphas, factor loadings, and t-statistics from monthly calendar-time Fama-French regressions for both equal-weighted and value-weighted portfolios based on sector adjusted change in CSR-scores, only considering firms present in the S&P 500 at the rebalancing point each year. Panel A reports results from the overall period, Panel B from the period before materiality considerations became available, and Panel C from the period after materiality consideration became available. All panels distinguish between total, material and immaterial scores, and contain R-squared from the regressions as well as the annualized difference in alpha between the top and bottom quintile portfolios and the accompanying t-statistic. In the models, Mkt-rf is the market excess return, SMB and HML are the Fama and French (1993) size and book-to-market factors, RMW and CMA are the Fama and French (2015) profitability and investments factors.

F.3 Fama-French Five-Factor Model Adjusted Performance Across Score Specifications

FF5 Adjusted Annualized Performance of CSR portfolios (in %)

	Raw Scores				Sector Adjusted Scores			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	0,9450	0,6627	0,8638	0,5345	0,6589	0,4625	1,0985	0,6883
Material	1,3672	0,6407	1,0880	0,5184	-0,5636	-0,3883	-1,2735	-0,7788
Immaterial	0,7868	0,4057	1,0647	0,6413	1,0629	0,6510	1,4500	0,9936
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	1,5208	0,7966	1,4567	0,6971	1,1295	0,5913	2,7533	1,3796
Material	3,9528	1,5284	3,2163	1,1969	-0,8964	-0,4722	-2,7194	-1,2561
Immaterial	-1,5537	-0,6538	-0,6838	-0,3256	1,2423	0,5702	1,8033	0,9225
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	1,1086	0,5815	0,6246	0,2428	1,0416	0,5402	-0,1764	-0,0665
Material	-1,5738	-0,5120	-1,0244	-0,3639	1,2313	0,6485	0,7554	0,3254
Immaterial	4,2318	1,4974	3,3698	1,2475	0,7140	0,3460	1,0615	0,4866
	Score change				**Sector Adjusted Score Changes**			
	EW		VW		EW		VW	
Score	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat	Q5-Q1	T-stat
Overall period - Jan 2004 to Dec 2018 (T=180)								
Total	-0,0293	-0,0177	1,5427	0,9150	-0,7820	-0,4979	-1,2778	-0,7306
Material	0,8062	0,5116	1,4159	0,8553	-1,7325	-1,0127	-1,7246	-1,0441
Immaterial	-0,8180	-0,5148	0,1931	0,1098	0,2161	0,1312	1,6160	0,8573
Pre-SASB - Jan 2004 to Dec 2013 (T=120)								
Total	1,1641	0,5360	0,9345	0,4469	0,4309	0,2059	-1,1867	-0,5300
Material	1,3001	0,6391	-0,6944	-0,3374	-0,8830	-0,3864	-2,8544	-1,3344
Immaterial	1,5530	0,7950	0,8587	0,3642	-0,8482	-0,4112	0,0697	0,0274
Post-SASB - Jan 2014 to Dec 2018 (T=60)								
Total	-3,1000	-1,4352	0,1873	0,0683	-3,3342	-1,5991	-2,5754	-0,9724
Material	-0,4088	-0,1849	4,0642	1,4466	-2,5068	-1,1263	-0,2774	-0,1023
Immaterial	**-4,8784**	**-2,1080**	-2,0718	-0,8563	0,3034	0,1203	2,2711	0,9485

The table reports the difference in annualized alphas and t-statistics from monthly calender-time Fama-French 5-factor regressions between the top and bottom quintile portfolios, sorted on total, material and immaterial CSR score, only considering firms present in the S&P 500 at the rebalancing point each year. The table segregates between 3 periods: the full period, the period before SASB released their materiality considerations, and the period after. The table further distinguish between equal-weighted and value-weighted portfolio construction. The alpha differences are displayed in full percentages. Values in bold are statistically significant results at the 10 % significance level for a 2-sided test.

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